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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/727,764	12/03/2003	H. Grant Wang	03-0041 BOE-63(1)	7578
55132 7590 07/28/2008 WILDMAN HARROLD ALLEN & DIXON LLP AND THE BOEING COMPANY 225 W. WACKER DR. CHICAGO, IL 60606				
EXAMINER DINH, TIEN QUANG				
ART UNIT		PAPER NUMBER		
3644				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/727,764

**Applicant(s)**

WANG ET AL.

**Examiner**

Tien Dinh

**Art Unit**

3644

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 4/4/08.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☐ Claim(s) \_\_\_\_\_ is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SF 298)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 17, 21, 23, 27, 35 and 36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claims 35 and 36, applicant claims attitude sensor set “consisting” of at predetermined number of star trackers and at least one gyro device.” The examiner maintains this rejection.

RE claims 1, 27, it is claimed that the spacecraft attitude, spin rate, and acceleration based solely on one sensor or from one star tracker is used by the processor to control the spacecraft. How is this possible? The applicant states in his specification on page 7 that both the star tracker and the gyros are used to determine the spacecraft attitude, spin rate, and acceleration and not solely on the star tracker. In claim 1, especially, it is claimed that the processor receives input from a plurality of sensors but also goes on claiming only the star sensor provide inputs to the processor to control spacecraft. Seems that the gyros are used to determine the spin rate and the star tracker does not.

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1 and 21, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosick 6032904 in view of Bezooijen 5745869.

Hosick et al discloses a satellite having an in-space thrust system having a pair of electric thrusters for orbit raising (transfer orbit), station keeping (on-station operations) and unloading momentum wheels. The satellite has an attitude controller that receives attitude information from the onboard sensor suite 32. The controller compares the sensor input with the desired attitude provides to implement satellite movement control. Onboard sensor suite 32 comprises gyroscope (34) an earth sensor, a sun sensor and a star sensor (see Col. 6, lines 56-65). The plurality of sensors in the sensor suite 32 is used for transfer orbit operations and on-station operations. The star tracker can determine spacecraft spin rate (that can determine angular acceleration) and attitude since the rotation about targeted stars as a function of time determines the spin rate. The relative location of the satellite with respect to targeted stars determines the attitude. The gyro 34 is also capable of being used to determine spacecraft spin rate and attitude. A person skilled in the art would know this.

Although Hosick et al teaches that one of the primary objects of the present invention is to reduce the dependencies of chemical and liquid motors (i.e. bi-propellant) in favor of electric motors, Hosick never-the-less teaches that it is known in the art to use bi-propellant liquid motors for orbit transfer maneuvers. Therefore while Hosick et al teaches that electric motors are preferred especially for his invention, he does not teach completely away from using liquid bi-propellant motors.

The controller has “electronic equipment” and “software”. Controllers are programmable electrical devices. Hence since the controllers have software, the processor determines the attitude/spin rate, acceleration of the spacecraft.

Hosick does not teach the capability of being able to determine attitude from a single sensor input.

Bezooijen teaches A detector (13), camera electronics (14), and computer (15) located on board the spacecraft (1) are used to generate a set of star match groups by matching pairs of stars observed by the detector (13) with pairs of guide stars from a stored database (18) of guide stars. The present invention is used for determining the attitude of a spacecraft 1 by means of sensing stars 2. It can be embodied in an autonomous star tracker, such as the Autonomous Star Tracker (AST) 10 being developed by Lockheed Palo Alto Research Laboratory in anticipation of the need for smart sensors capable of supporting autonomous, long-duration, space flight missions.

Detector 13 can be any type of sensor that measures intensity and position of objects in field of view 20, including an ICD or an active pixel sensor (APS). Attitude determination module 7 is then invoked to convert the position of the matched stars into the attitude of AST 10.

It would have been obvious to determine attitude from the input of a single detector or a set of the same detector (such as star trackers for redundancy), as taught by Beooijen for the purpose of increasing reliability of the system.

3. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hosick as modified by Bezooijen, as applied to claim 1 above, and further in view of the BOEING 702 fleet (publicly announced in October 1995, and launched in 1999). Hosick does not specifically disclose what the liquid motors are used for. However it has been known since at least October

1995 that satellites can combine electric, bi-propellant (liquid) and chemical engines for controlling the operations of a satellite. The BOE-702 satellites employ XIPS for final orbit insertions; liquid (bi-propellant) engines for lift the satellite into final orbit (orbit transfers). It would have been obvious to use the engines of the BOE 702 fleet on the thruster mounting configuration of Hosick for the purpose increasing versatility and maneuverability. (Alternatively the examiner could have rejected claims 1 and 17 over BOE702 in view of Hosick, where Hosick teaches that on-station and orbit transferring method steps).

4. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosick as modified by Bezooijen, as applied to claim 1 above, in view of Baghdasarian (6,010,096). Hosick does not disclose deployable solar arrays. Baghdasarian discloses that it is well known in the art to have solar arrays, which are deployable. (See Col. 3, lines 60+). It would have been obvious to one having ordinary skill in the art, at the time the invention was made to employ deployable solar wings for the purpose of reducing the area required for transporting the satellite to space (allowing it to fit within the payload bay of a shuttle).

Claims 27, 35, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosick in view of Bezooijen and Needelman 6266616.

Hosick in view of Bezooijen disclose all claimed parts (see the rejections above) but are silent on using more than one star tracker/sensor. However, Needelman teaches that the use of multiple star trackers (see abstract) is well known. One skilled in the art would have used more than one star sensor in Hosick's system as taught by Needleman for redundancy and to verify the

readings. Please note that since there is more than one star sensor in the sensor set, the processor would take in input from the start sensors. This leads to redundancy and data check. For example, if one star sensor was to fail, another sensor is there to provide attitude data to the processor. Plus, since there is more than one star sensor, one sensor's data can be checked with another to verify that the data match.

### *Response to Arguments*

Concerning the rejection under 35 USC 112, the transitional phrase "consisting of" excludes any element, step, or ingredient not specified in the claim. In re Gray, 53 F.2d 520, 11 USPQ 255 (CCPA 1931); Ex parte Davis, 80 USPQ 448, 450 (Bd. App. 1948) ("consisting of" defined as "closing the claim to the inclusion of materials other than those recited except for impurities ordinarily associated therewith.")). In this case, please note that the terms "comprising" and "consisting" contradicts each other. Comprising is open ended while consisting is close ended.

Applicant's arguments filed 4/4/08 have been fully considered but they are not persuasive. The applicant argues that "nowhere does Hosick discuss or suggest that the spacecraft can be controlled based on the input received from only one of the sensors. Therefore, Hosick discloses a system where an entire sensor suit is required in order to determine the attitude, spin rate, and acceleration of the spacecraft to control the spacecraft." First, see the rejection above under 35 USC 112, 2nd paragraph concerning claims 1 and 27. As best understood, the examiner maintains that the star sensor of Hosick sends inputs into the processors to control the spacecraft. This meets what has been claimed. Since a star sensor is

inputted into the processor, the processor has software to determine the attitude as well as the acceleration and capable of detecting the spin rate. Bezooijen was used to teach that a single sensor such as a star sensor can be used on a spacecraft. Hence, one skilled in the art would have used a single sensor in Hosick's system as a way to save weight. Claims 35 and 36 have sensor suites. The prior arts meet what has been claimed. Finally, it is clear that the structure as claimed is met by Hosick in view of Bezooijn. They disclose a star track, processor and means for controlling the spacecraft.

Concerning the Bezooijen, Needelman, Baghdasarian, and BOE702, these are references that show the claimed subject matter and lead on skilled in the art to have used the teaching to meet what has been claimed.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.



Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tien Dinh whose telephone number is 571-272-6899. The examiner can normally be reached on 12-8.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Mansen can be reached on 571-272-6608. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Tien Dinh/  
Primary Examiner, Art Unit 3644